

Tennessee Valley Authority, Post Office Box 2000, Soddy Daisy, Tennessee 37379-2000

Masoud Bajestani  
Site Vice President  
Sequoyah Nuclear Plant

September 2, 1997

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, D.C. 20555

10 CFR 50.73

Gentlemen:

TENNESSEE VALLEY AUTHORITY - SEQUOYAH NUCLEAR PLANT (SQN)  
UNIT 1 - DOCKET NO. 50-327 - FACILITY OPERATING LICENSE  
DPR-77 - LICENSEE EVENT REPORT (LER) 50-327/97012

The enclosed report provides details concerning a Unit 1 manual reactor trip resulting from a loss of control air. This condition is reported in accordance with 10 CFR 50.73(a)(2)(iv) as an event or condition that resulted in a manual actuation of the Reactor Protection System.

Sincerely,

*M. Bajestani*  
Masoud Bajestani

Enclosure

cc: See page 2

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U.S. Nuclear Regulatory Commission  
Page 2  
September 2, 1997

Enclosure

cc (Enclosure):

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# CATEGORY 1

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FACIL:50-327 Sequoyah Nuclear Plant, Unit 1, Tennessee Valley Auth 05000327  
AUTH.NAME . AUTHOR AFFILIATION  
RIDGELL,E.M. Tennessee Valley Authority  
BAJESTANI,M. Tennessee Valley Authority  
RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 97-012-00:on 970801,manual reactor trip was due to loss  
of control air.Caused by corrosion products (rust debris)  
inhibiting full closure of one of six-inch gate valves.  
Isolated breached control & svc air sys header.W/970902 ltr.

DISTRIBUTION CODE: IE22T COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 9  
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## LICENSEE EVENT REPORT (LER)

(See reverse for required number of  
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MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.FACILITY NAME (1)  
Sequoyah Nuclear Plant (SQN) Unit 1DOCKET NUMBER (2)  
05000327PAGE (3)  
1 OF 7TITLE (4)  
Manual Reactor Trip Due to Loss of Control Air.

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
8	1	97	97	-- 012	-- 00				Sequoyah, Unit 1	05000327
									FACILITY NAME	DOCKET NUMBER
									NA	05000
OPERATING		1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
			20.2201(b)			20.2203(a)(2)(v)			50.73(a)(2)(i)	50.73(a)(2)(viii)
POWER		100	20.2203(a)(1)			20.2203(a)(3)(i)			50.73(a)(2)(iii)	50.73(a)(2)(x)
			20.2203(a)(2)(i)			20.2203(a)(3)(ii)			50.73(a)(2)(iii)	73.71
			20.2203(a)(2)(ii)			20.2203(a)(4)			X 50.73(a)(2)(iv)	OTHER
			20.2203(a)(2)(iii)			50.36(c)(1)			50.73(a)(2)(v)	Specify in Abstract below
			20.2203(a)(2)(iv)			50.36(c)(2)			50.73(a)(2)(vii)	or in NRC Form 366A

## LICENSEE CONTACT FOR THIS LER (12)

NAME  
E. M. Ridgell, Industry AffairsTELEPHONE NUMBER (Include Area Code)  
(423) 843-7018

## COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

## SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO	EXPECTED	MONTH	DAY	YEAR
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## ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

While implementing a modification to improve the materiel condition of the Control and Service Air System at Sequoyah Nuclear Plant (SQN), the control air header pressure dropped rapidly after modifications personnel cut into a six-inch control air header located inside an equipment clearance boundary. The loss of control air pressure resulted in a runback of the Unit 1 and Unit 2 Turbines and instabilities in Unit 1 secondary side flows sufficient to warrant a manual trip of the Unit 1 reactor. The immediate cause of the loss of control air header pressure was corrosion products (rust debris) that inhibited full closure of one of the six-inch gate valves used as a clearance boundary. The root cause of this event is an inadequate work boundary during performance of work on the Control and Service Air System. The inadequate work boundary was the result of the poor materiel condition in this portion of the Control and Service Air System. Corrective actions include the following: 1) Operations personnel isolated the breach within approximately 7 minutes following the manual trip of Unit 1, 2) TVA will remove the corrosion buildup in the affected portions of the Control and Service Air System and will inspect other portions of the air system, as appropriate, for excessive corrosion, and 3) TVA will evaluate the adequacy and frequency of preventative maintenance (PM) on the affected portions of the Control and Service Air System and revise the PMs, as appropriate.

**LICENSEE EVENT REPORT (LER)**  
**TEXT CONTINUATION**

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
SQN Unit 1	05000327	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 of 7
		97 --	012	-- 00	

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

### I. PLANT CONDITIONS

Unit 1 was in power operation at approximately 100 percent.

### II. DESCRIPTION OF EVENT

#### A. Event

At approximately 1230 Eastern Daylight Time (EDT) on August 1, 1997, a hold order was established to permit modification of the "C" Control and Service Air compressor header [EIIS Code LF]. The hold order required isolation and closure of an isolation valve (0-VLV-32-534) located at the inlet of air receiver No. 2. The modification required a portion of the piping upstream of the isolation valve to be cut and removed in order to install an additional valve.

During implementation of the hold order, Operations personnel identified that valve 0-VLV-32-534 did not appear to have fully isolated and that a work request had previously been issued because of seat leakage. Operations personnel concluded that the acceptability of the hold order boundary could be determined following final placement of the hold order by opening a drain valve located on the "C" Control and Service Air compressor aftercooler to ensure the control air header within the hold order boundary was adequately depressurized.

When Operations personnel opened the aftercooler drain valve to verify the system boundary, they observed a small volume of water and a slight continuous flow of air discharging from the drain valve. They considered this to be indicative of a depressurized header with a small amount of leakage through valve 0-VLV-32-534. Operations and Modifications personnel also evaluated the leakage. These evaluations concluded the boundary was safe and that the work could be performed. When Modifications personnel completed cutting into the control air header, the header began to discharge at full system pressure (100 psig), and the control air system pressure began to drop rapidly. The loss of control air system pressure resulted in a Unit 1 and Unit 2 Turbine runback and instabilities in Unit 1 secondary side flows sufficient to warrant a manual trip of the Unit 1 reactor.

**LICENSEE EVENT REPORT (LER)**  
**TEXT CONTINUATION**

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
SQN Unit 1	05000327	97 --	012	-- 00	3 of 7

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

**B. Inoperable Structures, Components, or Systems that Contributed to the Event**

The inlet isolation valve (0-VLV-32-534) for the Control and Service Air receiver No. 2 failed to adequately isolate due to corrosion products (rust debris) that inhibited full closure.

The drain valve for the "C" Control and Service Air compressor aftercooler failed to provide indication of full system pressure when opened due to corrosion products (rust debris) plugging the drain line.

**C. Dates and Approximate Times of Major Occurrences**

08-01-97

1200 EDT

Operations personnel began placing the hold order for modification of "C" Control and Service Air compressor header and determined that the air receiver No. 2 inlet isolation valve may not have fully closed.

1230 EDT

The "C" Control and Service Air compressor aftercooler drain valve was opened to verify adequacy of the hold order boundary.

1245 EDT

Operations and Modifications personnel evaluated leakage through the aftercooler drain valve and concluded it was due to low level leakage through the boundary.

1929 EDT

Modifications personnel completed the pipe cut on the "C" Control and Service Air compressor header, and the control air header pressure low alarm was received in the Main Control Room (MCR).

**LICENSEE EVENT REPORT (LER)**  
**TEXT CONTINUATION**

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
SQN Unit 1	05000327				4 of 7
		97 --	012	-- 00	

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

**C. Dates and Approximate Times of Major Occurrences**  
**(Continued)**

1930 EDT	Service air and nonessential air automatically isolated.
1936 EDT	Unit 1 and Unit 2 turbine runback occurred.
1937 EDT	Unit 1 manual reactor trip initiated based on pending low condensate pressure.
1944 EDT	Operations personnel successfully isolated the Control and Service Air header, and the header pressure returned to normal.
2202 EDT	Notified NRC of Unit 1 Manual trip in accordance with 10 CFR 50.72(b)(2)(iii).

**D. Other Systems or Secondary Functions Affected**

None.

**E. Method of Discovery**

Annunciation of low control air header pressure in the MCR informed Operations personnel of the plant condition.

**F. Operator Actions**

Operations personnel (Assistant Unit Operators and supervisory personnel) responded immediately to the location of the air system modification and began efforts to isolate the leak. Control room personnel responded appropriately to the decreasing air header pressure and correctly tripped the unit due to low condensate pressures. Operations personnel stabilized the plant following the manual unit trip in accordance with emergency procedures.

**LICENSEE EVENT REPORT (LER)**  
**TEXT CONTINUATION**

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
SQN Unit 1	05000327	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	5 of 7
		97 --	012	-- 00	

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

**G. Safety System Responses**

Safety systems performed and plant parameters responded as expected for a loss of control air. Immediately following the manual reactor trip, Auxiliary Feedwater started as designed on Lo-Lo steam generator levels and provided flow to the steam generators at greater than 440 gpm per steam generator, as designed. Additionally, the Essential Air system header automatically isolated as designed on low pressure in the control air header.

**III. CAUSE OF THE EVENT**

**A. Immediate Cause**

The immediate cause of the loss of control air header pressure was corrosion products (rust debris) that inhibited full closure of one of the six-inch gate valves used as a clearance boundary.

**B. Root Causes**

The root cause of this event is an inadequate work boundary during performance of work on the Control and Service Air System. The inadequate work boundary was the direct result of the poor materiel condition in this portion of the Control and Service Air System. The poor materiel condition led Operations personnel to believe that the work boundary was adequately isolated when minimal airflow was observed following opening of the Control and Service Air compressor aftercooler drain valve.

**C. Contributing Factors**

None

**IV. ANALYSIS OF THE EVENT**

Safety systems performed and plant parameters responded as expected for a loss of control air. Plant response during and after the manual trip of Unit 1 was consistent with responses described in the final safety analysis report. Accordingly, the event did not adversely affect the health and safety of the public.



**LICENSEE EVENT REPORT (LER)**  
**TEXT CONTINUATION**

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
SQN Unit 1	05000327	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	6 of 7
		97 --	012	-- 00	

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**V. CORRECTIVE ACTIONS****A. Immediate Corrective Actions**

- Operations personnel isolated the breached Control and Service Air System header within approximately 7 minutes following the manual trip of Unit 1.
- TVA inspected and cleaned additional components within the affected portion of the Control and Service Air System for corrosion buildup.

**B. Corrective Actions to Prevent Recurrence**

- TVA will issue a lessons learned letter to Operations personnel to address weaknesses in how the determination was made that the work boundary was adequate.<sup>1</sup>
- TVA will quantify the source and transport mechanism for rust and debris in compressors, inter coolers, after coolers, valves, piping, and air receiver tanks in this portion of the Control and Service Air System.<sup>1</sup>
- TVA will inspect for extent of condition other portions of the air system(s) for corrosion buildup, as appropriate, and will take necessary steps to remove/reduce the buildup, if present.<sup>1</sup>
- TVA will perform selected accelerated PMs and refurbishment of Control and Service Air System components similar to those that have previously failed to fully status the rate and quantity of system degradation.<sup>1</sup>
- TVA will evaluate the adequacy of the frequency of preventative maintenance (PM) on the affected portions of the Control and Service Air System and will revise the PMs, as appropriate.<sup>1</sup>

**LICENSEE EVENT REPORT (LER)**  
**TEXT CONTINUATION**

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
SQN Unit 1	05000327	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	7 of 7
		97 --	012	-- 00	

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- Based on near term activities in progress, TVA will provide an integrated plan to systematically remove suspected system components from service and rework them to ensure they are sufficiently free of rust and corrosion products necessary for reliable operation of the system.<sup>1</sup>

**VI. ADDITIONAL INFORMATION****A. Failed Components**

None

**B. Previous LERs on Similar Events**

An event which closely resembled the current event was described in LER 50-327/92018. In that event, water entrained in the control air system air receiver was injected into the control air lines resulting in failure of components operated by the control air system. Corrective actions for this event were focused on the Control and Service Air receivers. These actions included development of PM procedures to schedule the routine cleaning of these receivers. Additionally, the non-essential control air receiver inlet and outlet piping was reviewed for adequacy. At the time of this event, SQN personnel did not consider the information available to be sufficient indication of failures upstream of the air receivers, and therefore, the corrective actions could not have been expected to prevent this event

**C. Other Information**

The plant materiel condition continues to be a focus area at SQN. The modification being implemented when this event occurred was the addition of two new Control and Service Air compressors and is a part of TVA's aggressive actions to correct the materiel condition concerns at SQN.

**VII. COMMITMENTS**

None

<sup>1</sup> TVA does not consider this corrective action a regulatory commitment. TVA's corrective action program will track completion of the action.